SYLLABUS FOR
MASTER OF SCIENCE IN BOTANY
UNDER CHOICE BASED CREDIT SYSTEM

ACADEMIC SESSION
w.e.f. 2020-2022

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Members of Board of studies of CBCS under Post-Graduate Syllabus as per Guidelines of the Binod Bihari Mahto Koyalanchal University, Dhanbad.

S.No		MEMBERS	DESIGNATION	SIGNATURE
01	**CHAIRMAN**	DR. KALPANA PRASAD	ASSOCIATE PROFESSOR, HEAD, UNIVERSITY DEPARTMENT OF BOTANY, BBMKU, DHANBAD.	
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		PROF. KUNOOL KANDIR	PROFESSOR, RANCHI UNIVERSITY (BOTANY)	
	MEMBERS	DR. J. N. SINGH	ASSOCIATE PROFESSOR, PRINCIPAL R. S. P. COLLEGE, DHANBAD	
03	**INVITED MEMBERS**	Dr. SANJAY KUMAR SINHA	ASSOCIATE PROFESSOR S.K.M.U (BOTANY)	

CONTENTS

COURSE STRUCTURE

SEMESTER	PAPER CODE Credit, Lectures	PAPER NAME	FULL MARKS	End Semester Marks	Mid Semester Internal Marks (Written 20 marks)+ Day to Day assessment includes extracurricular activities(5 marks) + Attendance (5 marks)
I	BOTF – 101 (5 Credits, 60 Lectures+ 15 tutorials)	Foundation	100	70	30
	BOT C – 102 (5 Credits, 60 Lectures + 15 tutorials)	Core	100	70	30
	BOT C – 103 (5 Credits, 60 Lectures + 15 tutorials)	Core	100	70	30
	BOTC/P – 104 (5 Credits, 75 lectures)	Practical	100	70	30

II	**BOTS–205 (5Credits,60 Lectures+15 Tutorials)**	**SKILL DEVELOPMENT COURSE (SEC)**	**100**	**70**	**30**
	BOTC–206 (5Credits,60 Lectures+15 Tutorials)	**CORE**	**100**	**70**	**30**
	BOTC–207 (5Credits,60 Lectures+15 Tutorials)	**CORE**	**100**	**70**	**30**
	BOTC\P–208 (5Credits,75 Lectures)	**PRACTICAL**	**100**	**70**	**30**
III	**BOTA09/BOTC-309 (Credits, 60 Lectures + 15 Tutorials)**	**OPEN / ELECTIVE CORE**	**100**	**70**	**30**
	BOTC- 310 (5 Credits, 60 Lectures + 15 Tutorials)	**CORE**	**100**	**70**	**30**
	BOTC- 311 (5 Credits, 60 Lectures + 15 Tutorials)	**CORE**	**100**	**70**	**30**
	BOTC\P- 312 (5 Credits , 75 Lectures	**PRACTICAL**	**100**	**70**	**30-**

IV	**BOTE-413A/ BOT- 413B/ BOT- 413C (5 Credits,60 Lectures + Tutorials)**	**DISCIPLINE CENTRIC ELECTIVE THEORY A: B: C:**	**100**	**70**	**30**
	BOT-E-414A/ BOT-E-414B/ BOT-E-414C (5 Credits, 60 Lectures + 15 Tutorials)	**DISCIPLINE CENTRIC ELECTIVE THEORY A: B: C:**	**100**	**70**	**30**
	BOT-C-415 (5 Credits,60 Lectures + 15 Tutorials)	**Core**	**100**	**70**	**30**
	BOT-D-416 (5 Credits, 150 Lectures)	**Dissertation/ Project**	**100**	**70**	**30**
		Total Marks	**1600**	**1120**	**480**

TF -101 T (**DIVERSITY OF LIFE)**

C01

CREDITS-05 (THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

In all nine questions of equal value will be set, out of which a student shall have to answer five questions. Q.no. 1 will be compulsory, consisting of seven very short answer type questions (each of two marks) covering the entire syllabus and the candidates are required to give their answer in maximum 50 words.

UNIT-01- TAXONOMY

Nomenclature , Classification, Biological species concept, Phenetics and Cladistics approaches to Classification.

UNIT-02-Protists

Photosynthetic Protists , Slime mold , Oomycetes

UNIT-03-Fungi

Mycorrhiza , Lichens

UNIT-04-Plantae

Algae (Plant life Cycle)

UNIT-05- Life Cycle of Land Plants
Bryophytes
Pteridophytes
Gymnosperms
Angiosperms

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC – 102 T PROKARYOTES AND VIRUSES
C02

UNIT-01-PROKARYOTES :

(a) General features of prokaryotes.

(b) Phylogenetic overview.

(c) Structure of bacterial cell , Bacterial genome, Bacterial chromosome, Plasmid.

(d) Bacterial Nutrition – Culture media, Bacterial growth.

(e) Horizontal gene transfer and genetic recombination – Transformation, Transduction, Conjugation

(f) Bacterial Taxonomy – General features of important bacterial groups – Archaebacteria, Bacterial toxins and control of microbial growth.

UNIT-02-VIRUSES:

Bacteriophage and its life cycle.
Plaque Assay, Genetic analysis of phage, Animal and Plant Viruses.

UNIT-03 – Prions And Viriod
Bacterial and Viral Diseases

UNIT-04- BIOPESTICIDES, IPM

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC – 103 T BIOMOLECULES AND CATALYSIS
C03

PROTEINS :

1. **Amino acids and Proteins**
2. **Fibrous and Globular Proteins**
3. **Protein Folding**
4. **Protein sequencing and assays**

Nucleic Acids
Nucleotides , Chargaff's rule

DNA
Structure of dsDNA, B- DNA, Z- DNA, Triplex DNA, G- Quadruplex, Stability of the dsDNA helix, DNA – denaturation, Quantification of nucleic acid, Supercoiled forms of DNA, DNA as a genetic material.

RNA
Alkali catalysed cleavage of RNA, RNA as a genetic material

CARBOHYDRATES
Monosaccharides and its derivatives
Disaccharides and glycosidic bond
Polysaccharides, Glycoproteins
Reducing and Non – Reducing Sugars

LIPIDS

Fatty Acids, Triacylglycerol and wax.
Phospholipids, Glycolipids, Steroids, Plasma lipoproteins

VITAMINS
Water and Fat Soluble Vitamins

ENZYMES

Naming and Classification of Enzymes
Kinetics and Mechanism of Action

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTC/P- 104 PRACTICAL
C04

1. Identification of the members of different groups of Algae/ Fungi.
2. Biochemical test of Carbohydrates, Proteins and Lipids
3. Study of External, Internal and Reproductive features of Bryophytes, Pteridophytes.
4. Technique of Bacterial staining.
5. Study of External, Internal and Reproductive features of Gymnosperms.
6. Spotting
7. Plant diseases
8. Viva- Voice
9. Practical Record, Field reports, Charts, Models etc.

SEMESTER II

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

In all nine questions of equal value will be set, out of which a student shall have to answer five questions. Q.no. 1 will be compulsory, consisting of seven very short answer type questions (each of two marks) covering the entire syllabus and the candidates are required to give their answer in maximum 50

BOTS- 205 (T) MUSHROOM CULTIVATION
C05

1. Introduction, history. Nutritional and medicinal value of edible mushrooms; poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus*.

2. Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag ,vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factorsaffecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.

3. Storage and nutrition : Short -term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in salt solutions. Nutrition -Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.

4. Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC- 206 (T) CELL , ORGANELLES AND IMMUNOLOGY
C06

CELL STRUCTURE AND FUNCTIONS

Cell its structure and functions, Plasma membrane, Transport across plasma membrane, membrane potential, Transport of Macromolecules across plasma membrane – Endocytosis, Fate of receptor, Exocytosis.

Ribosome – Protein targeting and translocation

Endoplasmic Reticulum

Transport of proteins from cytosol to ER, Transport of proteins from ER to Cis – Golgi.

Golgi Complex

Transport of protein from TGN to Lysosomes

Lysosomes, Vacuoles, Mitochondria, Plastids, Peroxisomes, Nucleus, Cytoskeleton, Cell junctions, Plant cell wall, Cell Signalling.

Cell Cycle

Role of Rb protein in cell cycle regulation, Replication Senescence.

Mechanism of Cell Division

Mitosis, meiosis, Non disjunction and aneuploidy, Apoptosis, Cancer.

IMMUNOLOGY

a) **Innate and Adaptive Immunity.**
b) **Cells of the Immune System – Lymphoid and Myeloid Progenitor.**
c) **Organs involved in the adaptive immune response – Primary and Secondary lymphoid organs / tissues.**
d) **Antigens – Major Histocompatibility Complex (MHC) molecules and antigen presentation, Antigen processing presentation.**
e) **Immunoglobulins – structure and functions.**
f) **B – cell maturation and activation.**
g) **Kinetics of the antibody response.**
h) **Monoclonal antibodies and Hybridoma technology.**

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC-207 (T) PLANT PHYSIOLOGY , METABOLISM AND BIOENERGETICS
C07

PLANT PHYSIOLOGY

Plant Water Realationship
Diffusion, Osmosis, Chemical Potential of water and Water Potential.
Radial movement of water from root pressure to the tracheary element.
Ascent of Sap – Mechanism

Transpiration – Mechanism of Stomatal Closing and Opening.

Mineral Nutrition
Liebig's law of the minimum, Biological Nitrogen Fixation.

Translocation in Phloem – Photoassimilates .

Plant Hormones – Auxins, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids – Hormone Signalling Pathway.

Photomorphogenesis
Phytochrome, Cryptochrome, Phototropin, Photoperiodism, Florigen.
Vernalisation, Flowering Genes.

Plant Development – Pollination and Self Incompatibility, Asexual Reproduction, Embryogenesis.

BIOENERGETICS

Aerobic Respiration, Glycolysis, Pyruvate Oxidation, Citric Acid Cycle, Anaplerotic reaction, Oxidative Phosphorylation, Inhibitors of Electron Transport, ATP – ADP exchange across the inner Mitochondrial membrane.

METABOLISM

Glyoxylate Cycle , Pentose Phosphate Pathway, Entner – Doudoroff Pathway.

PHOTOSYNTHESIS

Fate of light energy absorbed by Photosynthetic pigments, Concept of Photosynthetic Systems, C4 Cycle.

LIPID METABOLISM

Synthesis and storage of Triacylglycerols, Biosynthesis of Fatty acids and Cholestrol.

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTC/P- 208 PRACTICAL
C08

1. Cytological techniques : Pre – Fixation , fixation, mounting, squashing of root tips for the study of various stages of mitosis.
2. Study of different stages of meiosis in flower buds .
3. Osmosis / Diffusion.
4. Demonstration of Pollen Germination Stigma of Flower.
5. Embryo dissection.
6. Transpiration – Potometer.
7. Photosynthesis – Wilmott's Bubbler.
8. Spotting – Realated to theory papers.
9. Viva – Voice.
10. Practical Record, Herbarium, Field reports, Charts, Models etc.

SEMESTER III

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTA09/BOTC-309 (T) (OPEN ELECTVE CORE)
BIODIVERSITY (C09)

Microbes
Viruses – Discovery, general structure; Economic importance; Bacteria – Discovery, General characteristics and cell structure; Economic importance.

Algae and Fungi
General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Economic importance of algae.
Introduction- General characteristics; Economic importance of fungi; Edible fungi.

Introduction to Archegoniate
Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Bryophytes
General characteristics, adaptations to land habit, Range of thallus organization. Ecology and economic importance of bryophytes.

Pteridophytes
General characteristics, classification, Early land plants Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.

Gymnosperms
General characteristics, Ecological and economical importance.

PRACTICAL: Practical based on topics of paper biodiversity.

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC- 310- T - GENETICS
C10

Mendel's Principles
Mendel law of inheritance, Incomplete dominance and Codominance

Gene Interaction, Linkage and Crossing Over.

Gene linkage and gene mapping – Gene mapping from 2 point cross and 3 point cross, Interference and Coincidence, Tetrad analysis.

Sex Chromosome and Sex determination
Sex chromosome, Sex determination in plants, Sex linked traits and sex linked inheritance.

Quantitative Inheritance – Quantitative trait locus analysis, Heritability.

Cytogenetics – Chromosome Banding , Variation in Chromosome number, Chromosome Aberrations.

Genome
Genome Complexity, Gene, Introns, Gene duplicating, Transposable elements.
Chromosome
Packaging of DNA into Chromosomes, Heterochromatin and Euchromatin, Polytene Chromosome , Lampbrush Chromosomes, B- Chromosomes.

DNA Replication and Repair , SOS Response.

Transcription
Prokaryotic and Eukaryotic Transcription, Role of Activator and Co- activator , Regulation of Transcription in Prokaryotes (Operon Concept) and Eukaryotes.

Genetic Code- Elucidation, Code assignment and Function.

Protein Synthesis – Mechanism of Protein Synthesis (Initiation, Elongation, Termination)
Mutation - Mutagen, Types of Mutation , Fluctuation test, Replica plating experiment, Ames test.

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTC – 311 T ECOLOGY AND ENVIRONMENT BIOLOGY
C11

ECOLOGY

Shelford's Law of Toierance

ECOSYSTEM – Components, Productivity, Energy Flow , Food Chain, Ecological Efficiencies, Ecological Pyramid, Nutrient Cycling, Decomposition, Aquatic and terrestrial ecosystems, Biomes.

Population Ecology

Population Characteristics, growth, Life Cycle, Age Specific Mortality and surrounding population regulation, Life history.

Community Ecology

Community structure, Species Composition and Diversity, Simpson's diversity index, Shannon diversity index, Pielou's eveness index , Community diversity, Complexity and Stability, Ecological interdependence and interactions.

Lotka – Volterra Model, Ecological Niche

Ecological Succession – Pattern, Types, Mechanism and Models of Succession.

BIODIVERSITY

Level, Gradients and Magnitude of Biodiversity, Threats of Biodiversity and Conservation IUCN, Red List Categories.

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTC/P- 208 PRACTICAL
C12

1. Plant Anatomy related to ecological adaptation to determine frequency / density/ abundance in a grassland ecosystem.
2. Study of PH/ Dissolved oxygen / free CO2 in aquatic ecosystem.
3. Ratio on genetic interaction – Statistical Analysis.
4. Euchromatin – Heterochromatin – Nucleosome Model.
5. Isolation of algae and Bacteria from aquatic ecosystem.
6. Spotting.
7. Viva – Voice.
8. Practicals, Records, Charts, Models etc.

SEMESTER IV

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE – 413 A (T) ADVANCED GENETICS AND MOLECULAR BIOLOGY
C13

GENOME
– Genome Complexity, Aquisition of new genes, Organelle genome, Transposable elements, Genome mapping.

RNA Interference, Epigenetics

RECOMBINATION
Homologous and site specific Recombination.

DNA Cloning
Enzymes for DNA Manipulation, Template – Dependent DNA polymerase, Nucleases, End modification enzymes, Ligases, Linkers and Adaptors.

Vectors
Vectors for E. Coli, Cloning vectors for yeast, Vectors for plants.
Introduction of DNA into the host Cells – Bcterial and Plant Cell.

Recombinant Screening, Expression Vector – Expression system, Fusion protein.

DNA Library, DNA profiling, DNA markers.

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE- 413 A (T) EVOLUTION, SPECIES CONCEPT, TRANSGENIC PLANTS AND TISSUE CULTURE
C14

EVOLUTION

1. **Origin of Life**
2. **Biological Evolution and theories.**
3. **Population Genetics.**
4. **Evolutionary processes.**
5. **Species concept and Speciation**
6. **Molecular Phylogeny**

TRANSGENIC PLANTS

7. **General procedure used to make a transgenic plant.**
8. **Antisense technology.**
9. **Molecular Farming**

PLANT TISSUE CULTURE

10. **Cellular totipotency**
11. **Tissue culture media.**
12. **Types of culture.**
13. **Somaclonal and Gametoclonal variation.**
14. **Somatic Hybridization and Cybridization.**
15. **Applications of Cell and Tissue Culture.**

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTE/P- 413 A PRACTICAL
C15

1. **Preparation of stains Acetocarmine and Feulgen.**
2. **Karyotype study of metaphase chromosome (root tips of plant material).**
3. **Study of different stages of meiosis in flower bud.**
4. **Isolation of DNA.**
5. **Estimation of DNA by Spectrophotometer.**
6. **Chromosome banding Technique.**
7. **Spotting.**
8. **Record, Chart, Model etc.**
9. **Viva – Voice**

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE- 413 B (T) APPLIED ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

C13

GENERAL ECOLOGY

1) Ecosystem :
a) Modern concept, structural components, trophic structure, food chain, food web and ecological pyramids.
b) Ecological energetics: concept and mode of energy flow in aquatic ecosystem.
c) Productivity: types and methods of primary productivity and its measurement.
2) Community:
a) Structure: Analytic and synthetic characters with emphasis on I.V.I, and species diversity index (H).
b) Ecological niche, edges and ecotones.
c) Ecological niche succession : Types and process of succession, hydrosere and xerosere, concept of climax.
3) Phytogeography:
a) Biomes of world
b) Major vegetation types of India with special reference to Jharkhand.

: Resource Ecology
4) Natural resources:
a) Biodiversity-concept, importance and quantum of biodiversity.
b) Forest, wetland, mangroves, agriculture, fisheries and wild life resources of India.
5) Modem fuel and their environmental effect:
a) Methenogenic bacteria and biogas.
b) Convertion of sugar to ethanol.
c) Solar energy converters.
d) Petroplants.

6) Traditional knowledge and natural resources. Basic concept of traditional knowledge; traditional knowledge in management of biodiversity and water resources.

7) Microbial diversity:
a) Role of microbes in environment.
b) Microbes as biofertilizers.
c) Enrichment of ore by microbes (biohydrometallurgy, biobenefication, bisorption).
d) Microbial hydrogen production.
8) Wetlands: Definition, characteristic and productivity, major wetlands of India and their biotic resources.

: Limnology
9) Introduction and History of Limnology.
10) Lentic and Lotic ecosystem, quality of drinking water, strategies for conservation of fresh water.
11) Physico-chemical Characteristic of lentic and lotic ecosystem - Temperature, pH, conductivity, dissolved oxygen and free CO2. B.O.D and C.O.D, Total nitrogen, phosphorus, TDS (Total Dissolved Solid).
12) Biological diversity of aquatic ecosystem with special reference to Algae and Maesophytes.
13) Measurement of Primary Productivity in fresh water ecosystem.

: Applied Ecology
14) Remote sensing : Basic concept and application in pollution management and natural resource management.
15) Environmental protection act and forest protection act.
16) Sustainable development: Basic concept, principle and application.
17) Biomonitoring:
a) Concept of biomonitoring
b) Biomonitoring of water and air pollution.
c) Advantages of biomonitoring over conventional techniques.
18) A brief account of:
a) Biopiracy
b) Bioprospecting
c) Environmental economics
d) Village biodiversity register
e) Bioethics.

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE- 413 B (T) APPLIED ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

C14

POLLUTION ECOLOGY

1) Radiation pollution : Types and measurement of radiation, sources of radiation, impact of radiation on human health and its mode of action, strategy for control/ minimizing radiation

2) Climate change: Basic concept of climate change vis-a-vis global warming; present status and future projections of climate change; impact of climate change on agriculture, biodiversity and human health; adaptation and mitigation of climate change.

3) Solid waste management:
a) Source, generation and classification of solid waste.
b) Management and utilization of solid waste.
c) Fly ash and mine spoil and their management.
4) Air pollution:
a) Critical air pollutants and their Indian standard.
b) Air pollution due to coal mining.
c) Management of air pollution.
5) Depletion of water resources :
a) Alarming situation of ground and surface resources.
b) Rain water harvesting and recharging aquifers.
c) Conservation and management of fresh water ecosystem.

: Environmental Biotechnology
6) Concept of environmental biotechnology, its scope and achievement.

7) Thuringenesis toxin as natural pesticides.
8) Biotechnology for pollution abatement:
a) Bioscrubber b) Biofilter c) Biochips d) Biosensor
9) Bioremediation

Concept of bioremediation, hyperaccumulators.
b) Technology: phytoextraction, rhizofilteration, phytoestabilization, phytodegradation.
c) Bioremediation of polluted water, air and soil.
d) Advantages of bioremediation over conventional techniques.
10) Waste water treatment: Introduction, sources of water pollution; technology of waste water treatment-chemical and biological treatment.
11) Brief account of:
a) Vermitechnology.
b) Bioplastics.
c) Biomass from waste.

: Conservation Ecology
12) Principles and strategies for plant conservation:
(d) *In situ* conservation : International effect and Indian initiatives; protected areas in India-sanctuaries, national parks, biosphere reserves, wetlands, mangroves, sacred groves and coral reefs for conservation of wild biodiversity.
(e) *Ex situ* conservation : Gene banks, seed banks, cryobanks; General account of the activities of Botanical Survey of India (BSI); National Bureau of Plant Genetic Resources (NBPGR); Indian Council of Agriculture Research (ICAR); Council of Scientific and Industrial Research (CSIR); Central Institute of Medicinal and Aromatic Plants (CIMAP) and Department of Biotechnology (DBT) for conservation.

14): Local Environmental Problems and their Remedies
a) Forest degradation
b) Agrobiodiversity erosion.
c) Deforestation
d) Water depletion
e) Anthropogenic activities and its impact on environment.

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTE/P- 413 (B) PRACTICAL
C15

1) **To determine the pH, temperature, dissolved oxygen and free CO2 from aquatic ecosystem.**
2) **To determine the chloride content of water.**
3) **Collection, identification of different biota of fresh water ecosystem.**
4) **To determine the frequency, density, abundance, IVI and species diversity index (H) of grassland vegetation.**
5) **To determine the BOD and COD of different types of water samples.**
6) **Isolation of algae, bacteria and fungi from aquatic ecosystem.**
7) **Preparation of bacterial specimen and stain it with gram stain.**
8) **To determine the productivity by Dark & Light Bottle method.**
9) **A sum based on-standard error, 't' test or Analysis of variance.**
10) **Isolation of VAM from soil samples.**

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE- 413 C (T) MICROBIOLOGY ND PLANT PATHOLOGY

C13

1. **General Symptoms of Plant Diseases caused by Bacteria, Mycoplasma, and Virus.**
2. **Koch's Postulates and its importance in identification.**
3. **Classification of Gram +ve and Gram –ve Bacteria .**
4. **Microbial mechanism of pathogenicity.**
5. **Mechanism of Attack - Mechanical forces exerted by the pathogen on host tissues.**
6. **Chemical Weapons of Pathogens.**

a) **Enzymes : Role of enzyme in pathogenesis.**
b) **Toxins: Types of toxins and their role in pathogenesis.**

7. **Defence mechanism in plants.**

a) **Structural Defence Mechanism.**
b) **Chemical Defence Mechanism.**
c) **Phenolic Compounds role in Defence.**
d) **Phytoalexins.**

CREDITS-05(THEORY) **LECTURES: 60**
FULL MARKS: 70 **TIME: 03 HRS.**

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BOTE- 413 C (T) MICROBIOLOGY ND PLANT PATHOLOGY

1. Characteristics features of Plant Pathogenic Bacteria.

2. General Characteristics of Plant Viruses.

a) Classification of Plant Viruses.
b) Structure and composition of Viruses.
c) Virus Replication.

3. Transmission of Plant Viruses.

4. Antigen and antibody - the immune response

5. Antibiotics and their general mode of action an overview.

6. Management of Plant Diseases:

   a) Cultural methods.
   b) Quarantine.

7. Symptoms , etiology and methods of control of the following plant disease caused by fungi.

   a) Downy Mildew of Maize.
   b) Powdery Mildew of Peas.
   c) Loose Smut of Wheat.
   d) Covered Smut / Bunt of Wheat.
   e) Black Stem rust of Wheat.
   f) Tikka disease of Groundnut.
   g) Wilt of Arhar.
   h) Red rot of Sugarcane.
   i) Early Blight of Potato.
   j) Bacterial Blight of Paddy.
   k) Tobacco Mosaic
   l) Citrus Canker.
   m) Leaf Curl of Papaya.

CREDITS-05(PRACTICAL) **LECTURES: 75**
FULL MARKS: 70 **TIME: 06 HRS.**

BOTE/P- 413 (C) PRACTICAL
C15

1. **Structure of Bacteriophage and TMV by Photographs.**
2. Forms of Bacteria by Slides / Photographs.
3. Gram Staining technique.
4. Disease Identification (Included in the Syllabus)
   a) Name of Disease
   b) Name of Host.
   c) Name of Agent.
5. Spotting.
6. Class records, Charts, Models etc.
7. Viva – Voice.

BOT-D-416- DISSERTATION/ PROJECT

Research Methodology (Common for All Faculties)

Mid Semester Examination (MSE): There will be two groups of questions in written examinations of **30 marks.Group A is compulsory** consisting of **1 mark** each. **Group B** each, out of which any **four** are to be answered.

Broad topics of the syllabus are as under:

Introduction of Research Methodology:
Methods
Types of Research: Descriptive vs. Analytical Research, Applied vs. Fundamental Research, Quantitative vs. Qualitative Research, Conceptual vs. Empirical Research
Research Process: Basic Overview; Literature Review; Formulating the Research Problem, Hypothesis, Research Questions, Research Methodology
Data Collection: Primary and Secondary Data, Sampling Method, Observation Method, Interview
Method, Questionnaires, Case Study Method, Historical Method, Processing and Analysis of Data,
Interpretation of Data/Results, Conclusions/Findings.
Research Writing: Synopsis, Article/Research Paper, Research Project, Thesis, Dissertation, Book,
Book-Review, Case Review, Criteria of Good Research, Plagiarism
Citation Style & Methods: MLA, APA, Foot Note, Text Note, End Note,
References.

Reference Books:
a) Best and Kahn, Research Methodology, PHI Limited.
b) Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher.

BOT – D – 416 DISSERTATION / PROJECT

Students will visit any one of the following to prepare Summer training report.

1. Biofertiliser Unit.
2. Floriculture Unit.
3. Bio- Pesticide Unit.
4. Biofuel Unit.
5. Plant tissue culture Industries.
6. Solid Waste Management.
7. Fruit Processing Unit.
8. Effluent treatment plant.
9. Medicinal Plant Unit.

Format of question paper of Mid-Semester Theory Examination

Binod Bihari Mahto Koyalanchal University, Dhanbad
Mid Semester Examination xxxx (Session: xxxx-xx)
Subject/ Code:

Full Marks:20 Pass Marks:08 Time :1.5 Hrs

General Instructions:

Candidates are required to give their answers in their own words as far as practicable .

The questions are of equal value.

Answer any five questions of the following in which Q.1 is compulsory.

Group A **(1x5=05)**

Multiple Choice Questions

(i)…….
(ii)…….
(iii)……
(iv)……
(v)…….

Group B

(5x3=15)

(Descriptive answer type questions)
Answer any three of the following.

1. **……**
2. **……**
3. **…….**
4. **…….**
5. **……..**
6. **……..**

Note: *The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score of 5 marks and (c) Day to Day & Extracurricular activities of 5 marks."Best of Two" shall be applicable for computation of marks of SIA.*

(Attendance Upto75%, 1 mark; 75<Attd.<80, 2 marks;80<Attd.<85, 3 marks;85<Attd.90, 4 marks; 90<Attd. 5marks.)

Format of question paper of Mid-Semester Theory Examination

Binod Bihari Mahto Koyalanchal University, Dhanbad
Mid Semester Examination xxxx (Session: xxxx-xx)
Subject/ Code:

Full Marks:70 Pass Marks:28 Time :3 Hrs

General Instructions:

Candidates are required to give their answers in their own words as far as practicable .

The questions are of equal value.

Answer any five questions of the following in which Q.1 is compulsory.

Group A **(10x1=10)**

1. (A) Multiple Choice Questions

(i)…….
(ii)…….
(iii)……
(iv)……
(v)…….
(vi)…….

(B) Short Answer type questions **(5x2=10)**

(a) ……..
(b) ……..

Group B

(10x4=40)

(Long answer type questions)
Answer any four of the following.

2. ……
2. ……
3. …….
4. …….
5. ……..
6. ……..
7. ……..
8. ……..
9. Short notes type questions **(5x2=10)**

(a) ……
(b) ……..
(c) ……
(d) ……..